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METHOD FOR MANUFACTURING DRINK CONTAINING  
WATER-SOLUBLE DIETARY FIBER

Inventors:	Masaaki Fuse 9-1-304 Hirominishimoto-cho, Fuji-shi, Shizuoka-ken
	Katsumi Sakada 2-10-306 Fujimidai, Fuji-shi, Shizuoka-ken
	Kaori Sasaki 5-40-203 Hirkakihon-cho, Fuji-shi, Shizuoka-ken
	Hirokazu Kataura 490-17 Nakano, Fuji-shi, Shizuoka-ken
	Yoshifumi Ishii 3369-5 Obuchi, Fuji-shi, Shizuoka-ken

Applicant:

Towa Kasei Kogyo K.K.  
2-1-2 Ote-machi, Chiyoda-ku,  
Tokyo

Agent:

Keiichi Ota,  
patent attorney

[There are no amendments to this patent.]

### Claims

1. A method for manufacturing a drink containing a water-soluble dietary fiber, characterized by the fact that an arabinogalactan is added.
2. The method for manufacturing a drink containing a water-soluble dietary fiber of Claim 1, characterized by the fact that the molecular weight of the arabinogalactan is distributed in a range of 1000-160,000.

### Detailed explanation of the invention

#### Industrial application field

The present invention pertains to a method for manufacturing a drink containing a water-soluble dietary fiber, characterized by including an arabinogalactan obtained from a plant such as Japanese larch and soybean.

#### Prior art and problems to be solved by the invention

Recently, in Japan, as a result of transition of the diet to a Western type, excess caloric intake, inferiority of nutrient balance, etc., have been caused, and it is indicated that the change of food intake due to the advent of highly processed foods induces obesity, or various diseases such as hypertension, high cholesterol, diabetes, and cancer.

With such a warning from the relationship between diet and health, interest in the functional food field has increased, and substances having various physiological functions have been developed.

Low-calorie substances, substances having an intestinal flora improvement (*Bifidobacterium* multiplication) effect, substances for diabetics, etc., correspond to them [the above substances].

All of them are functional substances in terms of utilization in a living body of the substances themselves, while the functions of other substances originally included in ordinary foods in addition to nutrients such as carbohydrates, fats, proteins, vitamins, and minerals have also been reviewed.

It is said that dietary fiber is especially important among the substances other than the conventional nutrients.

In general, it is said that dietary fiber is a slightly digestible component or a high-molecular compound in foods that are not digested by human digestive enzymes.

Since the conventional recognition for dietary fiber is seldom utilized in the living body, a load is imposed on the digestive organs, and the utilization efficiency of nutrients is also lowered, so that it has been considered that it is not essentially required in the living body.

For this reason, the amount of intake of dietary fiber is markedly reduced, and for example, the amount of intake per Japanese person in 1985 was about 17 g (national nutrition survey of the Ministry of Health and Welfare) and corresponds to an amount reduced by about 20% of that of 1955.

On the contrary, the rate of the above-mentioned various geriatric diseases has increased, and as one of the main causes in recent dietetics, a deficiency in dietary fiber is mentioned, and the need for intake of a larger amount of dietary fiber has been strongly in demand.

As one of the methods for compensating the deficiency of the amount of intake of dietary fiber, various products processed by adding dietary fiber to ordinary foods are designed and manufactured.

First, a water-insoluble dietary fiber such as powder cellulose is used, and as examples of where it is used, there are sweets such as biscuits, cookies, and candies and foods such as certain kinds of desserts. Second, a water-soluble dietary fiber such as guar gum and pectin is used, and as examples of where they are used are foods such as mayonnaise, dressing, butter, margarine, sauces, and spreads.

However, since the amount of dietary fiber added to these foods is limited to a very small amount by strict restrictions due to the properties, textures, desired appearance, etc., it is impossible in a conventional diet to compensate for the total deficiency of dietary fiber.

For example, in a drink manufactured using guar gum, which is a water-soluble dietary fiber, even 1 wt% aqueous solution exhibits a very high viscosity (about 3000 cps). Thus, not only is it inappropriate for an ordinary drink texture, but even about 500 mL liquid with a high viscosity must be drunk to compensate for the amount of intake deficiency of the above-mentioned 20% (about 5 g).

In the guar gum and the pectin known as conventional water-soluble dietary fibers, since its aqueous solution has a high viscosity, in actuality, as the amount being added to drinks, about 0.05-0.1 wt% is adopted in juices, and 0.2-0.5 wt%, which is a very low amount being added, is adopted, even in drinks in which the viscosity of yogurt is allowed.

With the above background, drinks which are food forms that can easily incorporate a desired amount of dietary fiber, that is, drinks using a water-soluble dietary fiber, which has a very low viscosity and gives a favorable texture, have been in demand.

In order to respond to such a situation, research was conducted to utilize gums, which have a very high viscosity and are difficult to use, in drinks by lowering the viscosity by a certain method.

However, the viscosity decrease of these gums causes a decrease in the molecules of the components, so that the intrinsic functions such as slight digestibility as the dietary fiber are lost, which is not preferable.

Also, as for the economic efficiency, since gums with a low viscosity pass through complicated manufacturing processes, the cost is raised, so that their utilization in common drinks has been difficult.

Furthermore, it cannot be said that physiological functions, etc., are clarified, so that the effort to aggressively expand the use [of these gums] has not been made. Thereby, the utilization range has also been limited.

#### Means to solve the problems

These inventors measured the properties of various natural water-soluble dietary fibers that could be economically produced. Based on the results, we earnestly researched the utilization of various kinds of substances for use in drinks and succeeded in manufacturing drinks having new excellent properties by adding an arabinogalactan. Then, the present invention was completed.

In other words, according to the present invention, a drink, which has no influence on other components included in the drink and includes a necessary amount of water-soluble dietary fiber, can be manufactured by adding an arabinogalactan.

Here, the drink may include the arabinogalactan and may be any beverage such as a soft drink, carbonated drink, yogurt, processed milk, sports drink, fruit drink, nutritive aid drink, various drink agents, etc.

Also, the arabinogalactan usable in the present invention is ascribed to Japanese larch, soybeans, coffee beans, tea, etc., and it is necessary to particularly designate the raw materials.

Furthermore, it is not necessary to limit its manufacturing method in particular, however, for example, after extracting with a dilute acid under high temperature and high pressure from the above-mentioned various kinds of raw substances or a countercurrent extraction with water, the arabinogalactan can be manufactured by refining, enriching, and precipitating it by adding a solvent, or be directly manufactured as a powder by a spray dryer.

Also, the composition of the arabinogalactan is changed by its raw materials, raw material sampling time, etc.

As an example of the arabinogalactan obtained, when an arabinogalactan with a molecular weight of 1000-160,000 is manufactured from Japanese larch, a structure is formed in which a short side chain of D-galactose coupled with  $\beta$ -1,6 and a short side chain of L-arabinose coupled with  $\beta$ -1,3 are attached to the main chain of the galactan in which D-galactose is coupled with  $\beta$ -1,3, is formed.

As the sugar composition, usually, the D-galactose is a main component and is 80-90 wt%, and the L-arabinose is 10-20 wt%. In addition to them, a very small amount of uronic acid is sometimes included.

As its properties, for example, in 10-40 wt% aqueous solution of the arabinogalactan ascribed to the above-mentioned Japanese larch, the pH is 3-4.5, and the 40% aqueous solution exhibits a light-yellow to amber color.

As the solubility of the arabinogalactan in various kinds of solvents, for example, it is well dissolved in warm water and relatively well dissolved in cold water; however, the solubility in an organic solvent such as ethanol is low.

These inventors reviewed the properties and physiological performances of the arabinogalactan in detail prior to the present invention, and in particular, as one of the distinct properties, the viscosity is low.

For example, in particular, as for the arabinogalactan with a molecular weight of 1000-160,000 ascribed to Japanese larch, the relationship between the concentration and the viscosity is shown in Table 1.

Table 1 (Concentration and viscosity at 25°C of an aqueous solution)

① 濃度 (重量%)	② アラビノガラクトン	アラビウムガム ③
5 %	4 . 0	9 . 0
1 0	4 . 5	1 8 . 0
2 0	6 . 5	4 2 . 0
3 0	1 3 . 0	2 5 0 . 0
4 0	3 9 . 0	5 0 0 <
4 7	1 8 5 . 0	

④ (表中単位は c p s )

- Key: 1 Concentration (wt%)  
 2 Arabinogalactan  
 3 Gum arabic  
 4 (Unit in the table is cps)

As also seen from the table, the viscosity of the arabinogalactan is very low, compared with conventional gums that have been commonly used in drinks, and it can withstand uses in drinks at high concentration.

Furthermore, as a result of reviewing of the physiological functions, it was discovered that there were functions such as 1. Improvement action on constipation, 2. Blood sugar suppression action, 3. Increase in suppression action on cholesterol in blood (Chiba University, Horticulture Department Report No. 38, Additional print (1986), Yuko Ayano), 4. Blood pressure effect action, 5. Excretion action of poisonous substances in foods, 6. Intestinal flora improvement action, and 7. Arteriosclerosis suppression action, and the above-mentioned drink containing a water-soluble dietary fiber was completed.

Also, as the characteristics of the drink containing a water-soluble dietary fiber manufactured by the present invention, in addition to the above-mentioned various effects, a sufficient amount of intake is possible, and favorable texture and taste are exhibited.

Next, the contents of the present invention are explained in further detail by reference example, application examples, and comparative examples.

#### Reference example

A basic method for manufacturing the arabinogalactan used in the present invention is as follows.

An amount (2100 kg) of water seven times that of the sawdust it was added to was added to 300 kg sawdust (35 wt% moisture) of Japanese larch, so that an arabinogalactan was extracted under the conditions of standard temperature and 1 h.

Next, the extract except for the solid (the amount of solid fraction was 27.5 kg) was deodorized and decolored with activated carbon, purified by a deionizing operation with an ion-exchange resin, and enriched, so that an aqueous arabinogalactan solution (a concentration of 20%) (120 kg) was obtained.

Then, said aqueous solution was dried and powdered by a spray dryer, so that 23.4 kg pure white arabinogalactan powder (a content of 90 wt%) were obtained.

### Application Example 1

The drink of the present invention was manufactured by prescription 1.

#### Prescription 1 (fruit juice drink)

成分 ①	② 配合量
砂糖 ③	133.0 g
アラビノガラクトン ④	50.0
透明濃縮果汁 (レモン) ⑤	20.0
透明濃縮果汁 (グレープフルーツ) ⑥	20.0
クエン酸 ⑦	4.0
ビタミンC ⑧	0.5
精製水 ⑨	772.5
全量 ⑩	1000.0 g

Key:	1	Component
	2	Amount mixed
	3	Sugar
	4	Arabinogalactan
	5	Transparent enriched fruit juice (lemon)
	6	Transparent enriched fruit juice (grape juice)
	7	Citric acid
	8	Vitamin C
	9	Purified water
	10	Total amount

### Application Example 2

The drink of the present invention was manufactured by prescription 2.

#### Prescription 2 (soft drink)

成分 ①	配合量 ②
砂糖 ③	140.0 g
アラビノガラクトン ④	60.0
L-グルタミン酸ソーダ ⑤	4.0
カラナエキス ⑥	1.0
クエン酸 ⑦	4.0
香料 ⑧	0.1
精製水 ⑨	790.9
全量 ⑩	1000.0 g



Key:	1	Component
	2	Amount mixed
	3	Sugar
	4	Arabinogalactan
	5	Soda L-glutamate
	6	Guarana extract
	7	Citric acid
	8	Perfume
	9	Purified water
	10	Total amount

### Application Example 3

The drink of the present invention was manufactured by prescription 3.

### Prescription 3 (nutritive aid drink)

成分 ①	配合量 ②
還元麦芽糖水飴 ③	120.0 g
アラビノガラクトン ④	80.0
クエン酸ソーダ ⑤	3.0
L-アスパラギン酸ソーダ ⑥	1.0
L-スレオニン ⑦	1.0
L-イソロイシン ⑧	1.0
ビタミンB <sub>1</sub> ⑨	0.05
ビタミンB <sub>2</sub> ⑩	0.1
ビタミンB <sub>6</sub> ⑪	0.05
精製水 ⑫	793.8
全量 ⑬	1000.0 g

Key:	1	Component
	2	Amount mixed
	3	Thick reduced maltose syrup
	4	Arabinogalactan
	5	Soda citrate
	6	Soda L-aspartate
	7	L-Threonine
	8	L-Isoleucine
	9	Vitamin B <sub>1</sub>
	10	Vitamin B <sub>2</sub>
	11	Vitamin B <sub>6</sub>
	12	Purified water
	13	Total amount

### Comparative Example 1

Using a guar gum instead of the arabinogalactan of prescription 1, a comparative product 1 was manufactured.

### Comparative Example 2

Using a guar gum instead of the arabinogalactan of prescription 2, a comparative product 2 was manufactured.

The above-mentioned prescription and the comparative products were drunk in a trial by a panel of 10 persons. As a result, in prescriptions 1-3, the flavors of the other substances used were utilized, and the drink had no sense of incompatibility, was easily drunk, and included a dietary fiber having a favorable texture.

Also, the viscosity of the product of Prescription Example 1 was as low as 6 cps, and the product was easily drunk. On the contrary, the viscosity of comparative product 1 was 5000 cps or more, so that the product was not appropriate as a drink.

### Effect of the invention

As seen from the above description, according to the present invention, a drink, which has a low viscosity, has a favorable texture, and includes a sufficient amount of dietary fiber, can be manufactured.